

What is claimed is:

1. A circuit for providing a potential difference across a gap between two electrodes of a utilization device, the circuit including a power source, a transformer including a primary winding and a secondary winding for coupling across the electrodes, the power source coupled to the primary winding, a first switch coupled to one of the two terminals of the primary winding, and a second switch coupled to the other of the two terminals of the primary winding.

2. The apparatus of claim 1 wherein each of the switches further includes a second terminal coupled to the source.

3. The apparatus of claim 1 further including a source of operating frequency signals, the switches being coupled to the source of operating frequency signals.

4. The apparatus of claim 3 wherein the source of operating frequency signals comprises a source of signals at a frequency which is between about 0.1 times a resonant frequency of a circuit including the secondary winding and about 10 times said resonant frequency.

5. The apparatus of claim 4 further including the electrodes, said circuit including the secondary winding further including the electrodes coupled across the secondary winding.

6. The apparatus of claim 3 wherein the switches comprise solid state switches, each switch including a control terminal coupled to the source of operating frequency signals.

7. The apparatus of claim 6 wherein the switches comprise insulated gate bipolar transistors.

8. The apparatus of claim 6 wherein the switches comprise field effect transistors.

9. The apparatus of claim 1 wherein the utilization device comprises one of: a fuel reformer; an oxides of nitrogen trap; and, a soot filter regenerator.

10. The apparatus of claim 1 wherein the transformer comprises a core, the primary winding surrounding the core, the secondary winding surrounding the primary winding and wound in sections.

11. The apparatus of claim 3 wherein the source of operating signals comprises a source of signals having a fundamental frequency between about 20 KHz and about 100 KHz.

12. The apparatus of claim 11 wherein the source of operating frequency signals comprises a source of operating frequency signals having a fundamental frequency between about 500Hz and about 250KHz modulated by a modulating signal having a frequency between about 50Hz and 50 KHz.

13. The apparatus of claim 12 wherein the source of operating frequency signals comprises a source of operating frequency signals having a fundamental frequency between about 20 KHz and about 100 KHz modulated by a modulating signal having a frequency between about 2 KHz and about 10 KHz, the modulating signal having a variable pulsewidth defining a duty cycle.

14. The apparatus of claim 13 wherein the source of operating frequency signals comprises a source of operating frequency signals having a fundamental frequency between about 20 KHz and about 100 KHz modulated by a modulating signal having a frequency between about 2 KHz and about 10 KHz, the modulating signal having a variable pulsewidth defining a duty cycle between about 20% and about 100%.

15. The apparatus of claim 3 further including a sensor coupled to the source of operating frequency signals and adapted to sense a parameter of the utilization device.

16. The apparatus of claim 15 wherein the sensor comprises a device for providing a temperature-related output signal.

17. The apparatus of claim 15 wherein the sensor comprises a device for providing a pressure-related output signal.

18. The apparatus of claim 15 wherein the sensor comprises a timer which times elapsed time since the occurrence of an event.

19. The apparatus of claim 15 wherein the sensor comprises a device for sensing the time duration of each of multiple states of a system capable of assuming multiple states, for assigning respective weights to the sensed time durations, for accumulating the weighted, sensed time durations, and for providing an output when the accumulated, weighted, sensed time durations reach a threshold.

20. The apparatus of claim 19 wherein the sensor comprising a device for sensing the time duration of each of multiple states of a system capable of assuming multiple states comprises a device for sensing the time duration of operation of an engine in each of multiple ranges of at least one of engine load and engine torque.

5 21. The apparatus of claim 20 wherein the sensor comprises a device for sensing the time duration of operation of an engine in each of multiple ranges of both engine load and engine torque.

22. The apparatus of claim 15 wherein the sensor comprises a device for providing an output signal related to a concentration of a component of a fluid stream.

10 23. The apparatus of claim 22 wherein the sensor comprises a device for providing an output signal related to a concentration of a gas or mixture of gases in a gas stream.

24. The apparatus of claim 23 wherein the device for providing an output signal related to a concentration of a gas or mixture of gases in a gas stream comprises a
15 device for providing an output signal related to the concentration of at least one of oxides of nitrogen, nitrogen and oxygen in a gas stream.

25. A circuit for providing a potential difference across a gap between two electrodes of a utilization device, the circuit including a power source, a transformer comprising a core, a primary winding for inducing flux in the core, a secondary winding
20 oriented with respect to the core so that flux in the core induces voltage in the secondary winding, the secondary winding wound in sections and coupled to the electrodes, the power source coupled to the primary winding, and at least one switch coupled to the primary winding to induce current flow in the primary winding.

25 26. The apparatus of claim 25 wherein the primary winding is wound around the core.

27. The apparatus of claim 26 further comprising a dielectric interposed between the core and the primary winding.

28. The apparatus of claim 26 wherein the secondary winding is wound around the primary winding.

30 29. The apparatus of claim 28 further comprising a dielectric interposed between the primary winding and the secondary winding.

30. The apparatus of claim 25 wherein the at least one switch comprises a first switch coupled to a first terminal of the primary winding and a second switch coupled to a second terminal of the primary winding.

31. The apparatus of claim 30 wherein the power source is coupled to the primary winding intermediate the first and second terminals of the primary winding.

32. The apparatus of claim 30 further including a source of operating frequency signals, the switches being coupled to the source of operating frequency signals.

33. The apparatus of claim 32 wherein the switches comprise solid state switches, each switch including a control terminal coupled to the source of operating frequency signals.

34. The apparatus of claim 33 wherein the switches comprise insulated gate bipolar transistors.

35. The apparatus of claim 33 wherein the switches comprise field effect transistors.

36. The apparatus of claim 32 wherein the source of operating frequency signals comprises a source of signals at a frequency which is between about 0.1 times a resonant frequency of a circuit including the secondary winding and about 10 times said resonant frequency.

37. The apparatus of claim 36 further including the electrodes, said circuit including the secondary winding further including the electrodes coupled across the secondary winding.

38. The apparatus of claim 37 wherein the utilization device comprises one of: a fuel reformer; an oxides of nitrogen trap; and, a soot filter regenerator.

39. The apparatus of claim 38 further including a sensor coupled to the source of operating frequency signals and adapted to sense a parameter of the utilization device.

40. The apparatus of claim 39 wherein the sensor comprises a device for providing a temperature-related output signal.

41. The apparatus of claim 39 wherein the sensor comprises a device for providing a pressure-related output signal.

42. The apparatus of claim 39 wherein the sensor comprises a timer which times elapsed time since the occurrence of an event.

43. The apparatus of claim 39 wherein the sensor comprises a device for sensing the time duration of each of multiple states of a system capable of assuming multiple states, for assigning respective weights to the sensed time durations, for accumulating the weighted, sensed time durations, and for providing an output when the accumulated, weighted, sensed time durations reach a threshold.

44. The apparatus of claim 43 wherein the sensor comprising a device for sensing the time duration of each of multiple states of a system capable of assuming multiple states comprises a device for sensing the time duration of operation of an engine in each of multiple ranges of at least one of engine load and engine torque.

45. The apparatus of claim 44 wherein the sensor comprises a device for sensing the time duration of operation of an engine in each of multiple ranges of both engine load and engine torque.

46. The apparatus of claim 39 wherein the sensor comprises a device for providing an output signal related to a concentration of a component of a fluid stream.

47. The apparatus of claim 46 wherein the sensor comprises a device for providing an output signal related to a concentration of a gas or mixture of gases in a gas stream.

48. The apparatus of claim 47 wherein the device for providing an output signal related to a concentration of a gas or mixture of gases in a gas stream comprises a device for providing an output signal related to the concentration of at least one of oxides of nitrogen, nitrogen and oxygen in a gas stream.